Available online at www.sciencedirect.com

ScienceDirect

Energy Procedia 5 (2011) 2330–2334

Energy Procedia

IACEED2010

Research on Risk Management of Petroleum Operations

Zhang Yanting[a*], Xing Liyun[b]

[a]School of Economics and Management, China University of Petroleum, Dongying, 257061, China
[b]School of Management, University of Jinan, Jinan, 250022, China

Abstract

In the event of an accident, not only major economic losses but also serious environmental pollution will be caused because of the high risk of petroleum operations. Therefore, risk management is very important for petroleum enterprise. It is a top priority for petroleum enterprise to establish the risk management system and risk control mechanism according to the characteristics of the petroleum operations to meet the needs of modern management. This paper discusses the risk management of petroleum operations, and presents a number of specific recommendations and measures with the actual situations.

Keywords: Petroleum enterprise; Petroleum operations; Risk management

1. Introduction

Risk management is a scientific management method to identify, measure and analyze risk and on this basis to deal effectively with risk, to achieve maximum security at minimum cost. Risk management originated in the 20th century, 40 years of the U.S. insurance industry. It's the first time that Caryson has applied risk analysis to oil industry until 1960. In recent years, with the continuous development of business management, risk analysis theory and risk analysis method has matured, and many international petroleum enterprises pay more attention to risk management, and strive to minimize the risks, and risk management has been used as an important component of petroleum enterprise management. With the combination of theory and practice, risk management content and risk analysis method of oil enterprise are constantly developed. At present, risk analysis of international petroleum enterprise has grown from a simple risk analysis method to risk evaluation system or risk management. With the economic globalization, China's petroleum enterprises are facing more intense competitive situation. Oil industry is

* Zhang Yanting. Tel.: +0-086-546-8393255; fax: +0-086-546-8392331.
E-mail address: helen_zyt@163.com.

doi:10.1016/j.egypro.2011.03.400

the pillar industry of our country, so it is very important to strengthen risk management, especially risk control of petroleum operations.

2. Risk Analysis

Classification of petroleum operation risk is different from investment risk's. According to the theory of risk management, and combined with the characteristics of petroleum operations, this paper shows the risk classification of petroleum operation with the brief description.

2.1. Natural environmental risk

Climatic risk

In many cases, climatic conditions will affect the extent of petroleum operations. For example, there is great insecurity for borehole operation when it rains or snows, and there is great risk of heat stroke for petroleum operations in very hot weather.

Geologic risk

These factors such as structure and complexity of the petroleum pool, reserves and abundance of the petroleum pool, the nature of the petroleum pool, burial depth of the petroleum pool, initial formation pressure, permeability, active porosity, cave, fault conditions and underground rock hardness will affect the progress and quality of petroleum operations.

2.2. Engineering risk

Exploration risk

These factors such as improper use of exploration methods, inaccurate interpretation of seismic data and inaccurate positioning of the exploration wells in the exploration process may cause losses to the petroleum enterprise.

Development risk

These factors such as inappropriate mining method, delay in progress, engineering design changes and technical problems in the development process may cause losses to the petroleum enterprise. For example, there are big security risks for petroleum operations due to incorrect understanding of the stratum, casing damage, formation pressure too high, lack of well control awareness and many other factors.

Construction risk

Construction risk is the loss caused by factors such as technical deficiency, unmatched equipment and extended construction period during the process of constructing surface matching construction.

2.3. Management risk

Human resource risk

These factors such as the overall quality, operational level, cultural level, age composition of employees and the overall quality, management ability, leadership and charisma of managers will affect petroleum operations.

Organization risk

These factors such as unreasonable organizational mechanisms, inappropriate staffing, and irrational allocation of responsibilities will affect petroleum operations. In addition, organization risk will occur because of different understanding, attitudes and actions of the sectors of the petroleum operations. Organization risk will affect the operating period, thereby affecting the economic efficiency of enterprise.

Operating equipment risk

Operating equipment management will affect expected return in the process of petroleum operations. In the process of oil and gas exploration and development, operating equipment is one of the necessary equipment to improve the yield of oil wells, which runs directly affect the progress of the petroleum operations.

Dispute risk

The farmer's fields surround oil wells, so construction operations often subject to farmers. Every oil dispute between staffs and farmers involves a large number of compensation expenses, and every oil dispute has seriously affected the progress of the construction of wells. This causes petroleum operations great economic losses.

Environmental protection risk

Petroleum operations pollute the environment, so petroleum enterprise must comply with relevant environmental regulations and policies, and invest some money to treatment. If the petroleum enterprise creates environmental pollution because of its failure to take treating measures, it will be fined or even be ordered to suspend work, and petroleum operations will face the risk.

2.4. Economic risk

Financial risk

Petroleum operations have a long cycle, wide geographical distribution, a large number of employees and a large amount of funds, so the petroleum enterprise will face uncertainty such as financing, fund turnover, interest and exchange rate in the course of petroleum operations.

Market risk

Changes in the external economic environment and the uncertain market will lead to a loss of petroleum operations. For example, factors such as rising workover material price and fuel prices will lead to higher workover costs, and will lead to decreased effectiveness of petroleum operations.

Economic policy risk

Tax is an important means for state to control oil and gas production and supply and demand, and directly influence the level of profits of petroleum enterprise. At present, China's petroleum enterprise taxes include value added tax, consumption tax, corporate income tax, business tax, urban construction tax, education surtax, resource tax, the mineral exploration right user's fee, mineral exploration right purchase price, mineral resources compensation fee, property tax, land use tax, tariff duties and stamp duty and other taxes. In addition, petroleum enterprise also assumes implicit taxes, including the coordination costs of workers and peasants, river maintenance costs, road bridge compensation, comprehensive management costs, security guard costs, build projects and direct losses of stolen oil, gas and water. These costs and changes in national economic policy will bring benefits of oil construction operation to the uncertainty.

3. Strategies and Measures

3.1. Risk awareness

Sense of crisis

Oil construction workers must have a high risk of consciousness and a sense of crisis, and analysis the various risks faced, and take a proactive approach to resolve risk and control risk. Once all employees establish the strong sense of risk, the enterprise can take rapid action when it is facing major unexpected event, which can greatly reduce the possibility of loss.

Safety habits

According to statistics, 70% -80% of the enterprise accidents are caused by human operator error or illegal operation. Therefore, the petroleum enterprise should enhance the education of employees, and from time to time carry out inspection, advocacy and communication in various ways. For example, petroleum enterprise should use these methods such as posters, quiz contests, and technical competition to enhance the safety knowledge, and affix obvious signs or instructions on the wall or machine in accident-prone areas, and held regular accident exercise.

3.2. Fine management

Quality control system

Petroleum operations should establish a strict quality assurance system and quality responsibility system, to clarify their respective responsibilities and strictly control all aspects. In the whole process of management, first of all, we should establish quality objectives according to the conditions of operating team and the characteristics of the construction and then prepare construction design combined with quality objectives to develop specific plans and measures of quality assurance. During the whole process of construction, petroleum enterprise should meet the technical requirements to build the process flow, quality standard and operating instructions, and carry out standard operation, and adhere to the dynamic management, and establish a strict examination system, and continue to improve construction technology to ensure the quality of petroleum operations.

Petroleum enterprise should strengthen quality accident management, pay attention to the report, investigation and treatment of the accident and analyze the mass loss in time to reduce accidents.

Safety supervising and managing system

Petroleum enterprise should strengthen supervisory and inspection of job site safety, and see anti-illegal as the focus of the content of safety management, and strictly implement licensing system of special operations such as fire, breaking ground, high-lift operation, into the limited space and temporary electricity utilization.

Petroleum enterprise should improve the system of penalty for violation of safety regulation to make a clear definition of various types of acts in violation of regulations. Safety supervisors should be responsible, and they must strictly deal with acts in violation of regulations to form a strong safety Climate. Petroleum enterprise can set up team of safety supervisory and inspection that is composed of the experienced older workers. The team should carry out production supervision, and divide the responsibility to specific individuals. There is a clear division of responsibilities from the leadership to staff.

Petroleum enterprise should focus on monitoring the safety program development, implementation of risk identification measures, and the labor discipline at the job site to make the safety management further specification.

3.3. Core Technology

Core technology is the best indicator of core competitiveness of enterprise. An overview of the history of petroleum enterprises shows that for petroleum enterprise, technical progress such as 3-D seismic technology, horizontal drilling technology, deepwater drilling technology, ERD Wells drilling technology and cluster wells technology is the most durable and fundamental driving force. For petroleum operations, the first of all, they should carefully select research projects combined with development of the industry to concentrate on research; secondly, they should study the new operating equipment and technology combined with the need for specialized construction; thirdly, they should master key technologies in

related fields combined with the needs of external markets. With the expansion of enterprise, petroleum operations must focus on market needs, and continue to carry out technical innovation.

3.4. Highly-qualified personnel

Oil construction operation is a very professional job. The development of enterprise is relevant to whether they have highly-qualified personnel to control the commanding heights of industry.

Personnel mechanism

Petroleum enterprise should develop human resources planning to use pioneering personnel. In the daily management of the enterprise, it should establish the distribution system with responsibility, power and benefits, and the incentive mechanism for talent under which talented people can be put to the best use and be prepared for both promotion and demotion to promote competition.

Strategies for retaining talented staff

Petroleum enterprise has a strong talent pool, so it should focus on staff training, retain company's talents, play the ability of company's talents, which is the most realistic talent strategy for petroleum enterprise. If petroleum enterprise wants to retain talents, it must focus on the individual pursuit and the market value of the employees to implement the new way with the market demands.

4. Conclusion

Risk management is not passively to take risks, but actively to prevent and control risks. Risk management can significantly reduce the risk loss and provide compensation for the risk loss to make more social resources and funds reasonably flow to the desired sectors. Petroleum operations have large investment, long period and high risk, which determine risk management is required for them. Although the risks of petroleum operations are very complex, as long as petroleum enterprise can identify risk's causes, characteristics and nature, to some extent, it can prevent and control risks. Petroleum enterprise should improve risk management, establish risk prevention mechanism and risk processing system with their own actual situations to make the efficient use of funds and optimize the industrial structure of petroleum and natural gas.

References

[1] Du Yingfen. Enterprise Risk Management. Beijing: Economic Management Press; 2008:2-99.

[2] Sunzhu. Strengthen risk management, improve the international competitiveness of oil companies. Sinopec monthly. 2008; 3:10-11.

[3] Tong Xiaoguang，He Dengfa. Principles and methods of oil and gas exploration. Beijing: Petroleum Industry Press; 2001:236－237.

[4] Zheng Liping. A study on safety management in oil and natural gas companies. Journal of southwest petroleum university (social sciences edition).2010; 1:15-18

[5] Zujian, Sun Lihao. How to improve the anti-risk ability of oil companies. Economic Forum. 2007; 20:100-102.